REMARKS

The Examiner rejected Claims 1-6, 10, 19 under 35 U.S.C. 102(e) as being anticipated by Tanabe, *et al* (hereafter "Tanabe")(US 6,893,971). Applicant submits that these claims as amended above are not anticipated by, or obvious in view of, Tanabe.

The Examiner admits that Tanabe does not teach the claimed concentration range for BCl_3. The Examiner attempts to overcome this lack of teaching by maintaining that the concentration of BCl_3 is merely a design parameter to be optimized. However, as pointed out in the previous responses filed in the application, the concentration of BCl_3 is critical to the smoothness of the sidewalls. There is no teaching in Tanabe of such criticality. In fact, Tanabe teaches that it is the low power used in the etching system taught therein that is the reason that the substrate can be provided with a mirror finish; although, Tanabe never describes the conditions for providing this mirror finish, which is clearly lacking in the examples shown in Tanabe. Hence, Claim 1 and the claims dependent therefrom are not anticipated by, or obvious in view of, Tanabe.

With reference to Claim 19, Tanabe teaches a mixed gas etching system that includes Cl_2 and BCl_3; however, Tanabe does not provide any teaching as to the concentration of BCl_3 in that embodiment. Hence, Applicant submits that Claim 19 as amended above is not anticipated by, or obvious in view of, Tanabe.

With reference to Claim 6, Tanabe does not teach the concentration of the first gas in the reactor. The passage cited by the Examiner relates to the relative flow rates of HI and He into the reactor. The relative concentration of HI in the reactor cannot be determined without additional information such as the rate of chemical reactions that remove HI from the reactor. In this regard, it should be noted that the He is an inert gas, and hence, is not chemically removed from the reactor. Thus the actual relative concentration of HI in the reactor will be less than that in the input gas stream by an amount that is not taught in Tanabe. Accordingly, there are additional grounds for allowing Claim 6.

With respect to Claim 8, the Examiner stated that Tanabe discloses flowing CH_4 and H_2 into the reactor in addition to the other two gases. The Examiner points to the passage at

col. 9, lines 8-10 as supporting this proposition. Applicant must disagree with the Examiner's reading of that passage. The passage in question refers to the use of these two gases in a prior art two-gas RIE system that lacked BCl_3. Furthermore, Tanabe clearly points out the inadequacy of such prior art systems; hence, if anything, the cited passage teaches away from the present invention as claimed in Claims 8 and 9. Thus, there are additional grounds for allowing Claims 8 and 9.

The Examiner rejected Claims 11-16 under 35 U.S.C. 102(e) as being anticipated by Tanabe (US 6,893,971). Applicant traverses this rejection.

With respect to Claim 11, the Examiner maintains that Tanabe teaches an etching system in which all four of the listed gases are present. In particular, the Examiner points to the passage at col. 9, lines 8-10 as teaching the addition of CH_4 and H_2 to the combination of HI and BCl_3. Applicant must disagree with the Examiner's reading of that passage. As noted above, the passage in question refers to the use of CH_4 and H_2 in a two-gas prior art RIE system that lacked BCl_3. Furthermore. Tanabe clearly points out the inadequacy of such prior art systems; hence, if anything, the cited passage teaches away from the present invention as claimed in Claims 8 and 9. Hence, Claim 11 and the claims dependent therefrom are not anticipated by Tanabe.

With respect to Claim 16, Tanabe teaches only the concentration of the first gas in the input flow stream in a system in which the etching gas mixture consists of HI and He. As noted above, the cited teaching is insufficient to determine the concentration of the first gas in the reactor. Hence, there are additional grounds for allowing Claim 16.

The Examiner rejected Claims 7-9, 17-18, 20-21 under 35 U.S.C. 103(a) as being unpatentable over Tanabe in view of Bhardwaj, *et al* (hereafter "Bhardwaj")(US 6,261,962). The above amendments place the limitation of Claim 7 into Claim 1 and cancel Claim 7; hence, this rejection is moot with respect to Claim 7. Applicant submits that these claims are not obvious in view of the cited references.

Applicant repeats the arguments made above with respect to the lack of obviousness of Claim 1, as amended above, (i.e. Claim 7). The Examiner basically argues that Tanabe

teaches that the flow rates of the gases can be adjusted and that Bhardwaj teaches that the gas flow rate is a result effective variable. However, the Examiner does not point to any teaching with respect to what result is effected. The issue is not whether the various gas rates affect the etching results, but rather whether one would be led to adjust the gas flow rates to arrive at the system as claimed. As noted above, Tanabe does not provide any example in which the concentration of BCl_3 is in the claimed region or that the concentration of BCl_3 is a particularly critical variable. The present invention, in contrast, is based on an observation that the BCl_3 is critical in providing a smooth sidewall etch. As noted above, if anything, Tanabe teaches that a smooth substrate is obtained by maintaining the apparatus at low power dissipation rather than by adjusting the flow of any particular gas.

The Examiner goes on to state that Bhardwaj teaches a method for etching semiconductor substrates that includes adjusting the flow rate of etchants such as CH_4 and H_2. The Examiner points to a passage from col. 35 to col. 40 as supporting this. Applicant must point out that there are no such columns in the reference. At most, Bhardwaj teaches that in one etching system utilizing a different gas mixture than that taught in Tanabe, the flow rates can be adjusted to provide sidewall passivation. However, there is no reasonable expectation that such variables would provide a benefit in a system based on different gases in a different type of reactor. Sidewall passivation is a property of the specific chemistries as well as the etching conditions and apparatus. Furthermore, there is no teaching that sidewall passivation provides any particular benefit, such as smooth sidewalls in the etched trenches or vias.

To sustain a rejection under 35 U.S.C. 103, the Examiner must show that the combined references teach each of the elements of the claim or that there is some motivation in the art for altering one of the teachings to arrive at the combined set of teachings. "The mere fact that a reference could be modified to produce the patented invention would not make the modification obvious unless it is suggested by the prior art." (*Libbey-Owens-Ford v. BOC Group*, 4 USPQ 2d 1097, 1103). In addition, the Examiner must show that there is some motivation in the art that would cause someone of ordinary skill to combine the references, and that in making the combination, there was a reasonable expectation of success. Where the claimed subject matter has been rejected as obvious in view of a combination of prior art references, a proper analysis under section 103 requires, *inter alia*, consideration of two factors: (1) whether the prior art would have suggested to those of

ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success... Both the suggestion and the reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure. *In re Vaeck*, 20 USPQ2d 1438, 1442(CAFC 1991). Hence, Applicant submits that the Examiner has failed to make a *primia facia* case for obviousness with respect to Claim 1 and the claims dependent therefrom.

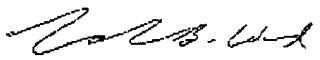
As noted above, Tanabe does not teach the four-gas system of Claim 8. At best Tanabe teaches that there are two different etching systems based on different pairs of gases. Accordingly, there are additional grounds for allowing Claim 8 and the claims dependent therefrom, i.e. Claims 9 and 18.

With respect to Claim 17, Applicant repeats the arguments made above with respect to the lack of teaching with respect to a four-gas etching system as claimed in Claim 11 from which Claim 17 depends. In addition, the Examiner admits that Tanabe does not teach the concentration range of Claim 17. The Examiner attempts to overcome this problem by characterizing the limitation as mere optimization of a process variable. However, as noted above, the particular process variable is critical to the performance of the system in terms of providing smooth sidewalls. If anything, Tanabe teaches that the process variable to optimize to provide a mirror finish is the power levels in the reactor. Hence, Tanabe teaches away from optimizing this variable as claimed. Accordingly, there are additional grounds for allowing Claim 17.

With respect to Claim 20, the Examiner has not pointed to any teaching of such a three-gas etching system. Applicant repeats the arguments made above with respect to the Examiner's mis-reading of the teaching of Tanabe with respect to the inclusion of CH_4 and H_2 in an etching system utilizing BCl_3. Bhardwaj does not provide the missing teachings. Hence, Applicant submits that the Examiner has not made a *primia facia* case for obviousness with respect to Claims 20 and 21.

I hereby certify that this paper is being sent by FAX to 571-273-8300.

Respectfully Submitted,



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